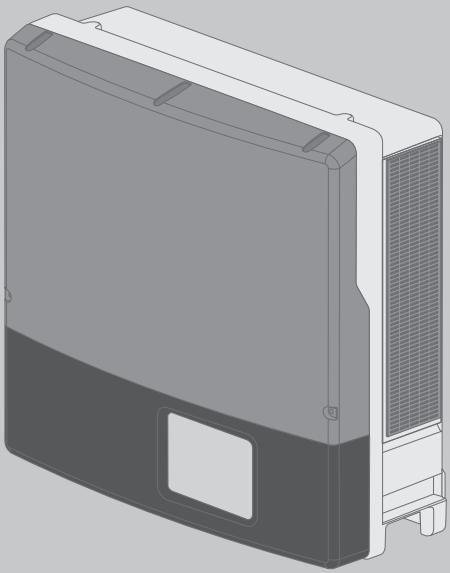
Operating Manual

SUNNY TRIPOWER 20000TL / 25000TL



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AMERICAN ENGLISH

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1 Information on this Document

This document is valid for the following device types:

- STP 20000TL-30 (Sunny Tripower 20000TL)
- STP 25000TL-30 (Sunny Tripower 25000TL)

Target Group

This document is intended for qualified persons and end users. Some of the tasks described in this document must only be performed by qualified persons with the appropriate skills (see Section 2.2 "Skills of Qualified Persons", page 7). Such tasks are marked with a warning symbol and the caption "Qualified person". Tasks that do not require any particular qualification are not marked and can also be performed by end users.

Additional Information

Links to additional information can be found at www.SMA-Solar.com:

Subject	Document type and document title
Troubleshooting and cleaning, decommissioning	Service Manual "Sunny Tripower 20000TL / 25000TL"
Operating parameters and their configuration options	Technical Information "Parameter List"
Overview of the rotary switch settings for configuring the country data set and display language	Technical Information "Overview of the Rotary Switch Settings"
Efficiency and derating behavior	Technical Information "Efficiency and Derating"
Selection of the residual-current device	Technical Information "Criteria for Selecting a Residual-Current Device"
Selection of the AC circuit breaker	Technical Information "Circuit Breaker"
Ground fault in the PV system (insulation resistance R_{iso})	Technical Information "Insulation Resistance (Riso) of Non-Galvanically Isolated PV Systems"
Firmware update	Technical Description "Firmware Update with SD Memory Card"
Speedwire/Webconnect connection	Installation Manual "SMA Speedwire/Webconnect data module"
RS485 connection	Installation Manual "RS485 data module"
Registration in Sunny Portal	User Manual "Webconnect Systems in Sunny Portal"
Setting or changing operating parameters	User Manual "Sunny Explorer"

Symbols

Symbol	Explanation
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	Indicates a hazardous situation which, if not avoided, can result in death or serious injury
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, can result in property damage
⚠ QUALIFIED PERSON	Sections describing activities to be performed by qualified persons only
i	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
✖	A problem that might occur

Nomenclature

Complete designation	Designation in this document
Sunny Tripower	Inverter, product

2 Safety

2.1 Intended Use

The Sunny Tripower is a transformerless PV inverter with two MPP trackers which converts the direct current of the PV array to grid-compliant three-phase current and feeds it into the utility grid.

The product is suitable for indoor and outdoor use.

The product must only be operated with PV arrays of protection class II, in accordance with IEC 61730, application class A. The PV modules must be suitable for use with this product.

PV modules with a high capacity to ground must only be used if their coupling capacity does not exceed 3.5 µF (for information on how to calculate the coupling capacity, see the Technical Information "Leading Leakage Currents" at www.SMA-Solar.com).

All components must remain within their permitted operating ranges at all times.

The product must only be used in countries for which it is approved or released by SMA Solar Technology AG and the grid operator.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Making unauthorized changes will void the warranty and will normally result in invalidation of the operating permit. SMA Solar Technology AG shall not be held liable for any damages caused by such changes.

Any use of the product other than described in the Intended Use section does not qualify as intended use.

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient place for future reference and observe all instructions contained therein.

The type label must remain permanently attached to the product.

2.2 Skills of Qualified Persons

Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and systems
- Training in the installation and commissioning of electrical devices and systems
- Knowledge of the applicable standards and directives
- Knowledge of and compliance with this document and all safety precautions

2.3 Safety Precautions

This section contains safety precautions that must be observed at all times when working on or with the product.

To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and follow all safety precautions at all times.

⚠ DANGER

Danger to life due to high voltages of the PV array

When exposed to sunlight, the PV array generates dangerous DC voltage which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks. If you disconnect the DC connectors from the inverter under load, an electric arc may occur leading to electric shock and burns.

- Do not touch uninsulated cable ends.
- Do not touch the DC conductors.
- Do not touch any live components of the inverter.
- Have the inverter mounted, installed and commissioned by qualified persons with the appropriate skills only.
- If an error occurs, have it rectified by qualified persons only.
- Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document (see Section 9, page 34).

⚠ DANGER

Danger to life due to electric shock

Touching an ungrounded PV module or an array frame can cause a fatal electric shock.

- Connect and ground the PV modules, array frame and electrically conductive surfaces so that there is continuous conduction. Observe the applicable local regulations.

⚠ WARNING

Risk of burns due to hot enclosure parts

Some parts of the enclosure can get hot during operation.

- Do not touch any parts other than the lower enclosure lid of the inverter during operation.

NOTICE

Damage to the seal of the enclosure lids in subfreezing

If you open the upper and lower enclosure lids in subfreezing conditions, the enclosure's seal can be damaged. This can lead to moisture entering the inverter.

- Do not open the inverter at ambient temperatures lower than -5 °C.
- If a layer of ice has formed on the seal of the lid in sub-zero conditions, remove it prior to opening the enclosure lids of the inverter (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your distributor if the scope of delivery is incomplete or damaged.

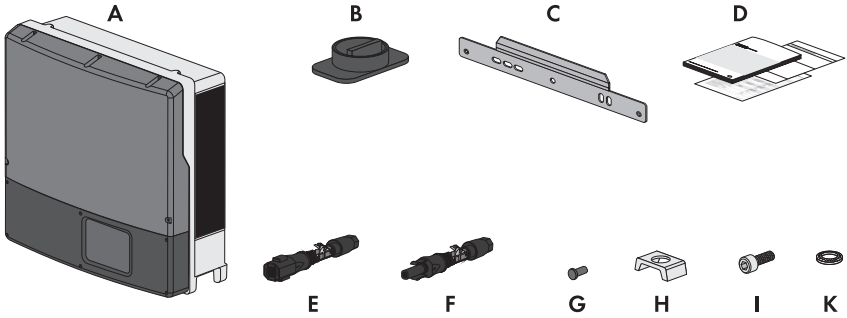


Figure 1: Components included in the scope of delivery

Position	Quantity	Designation
A	1	Inverter
B	1	Handle of the DC load-break switch
C	1	Wall mounting bracket
D	1	Operating manual, supplementary sheet with default settings, installation manual of the DC connector
E	6	Negative DC connectors
F	6	Positive DC connectors
G	6	Sealing plug
M	1	Clamping bracket
N	1	Cylindrical screw M6
O	1	Conical spring washer M6

4 Product Description

4.1 Sunny Tripower

The Sunny Tripower is a transformerless PV inverter with two MPP trackers which converts the direct current of the PV array to grid-compliant three-phase current and feeds it into the utility grid.

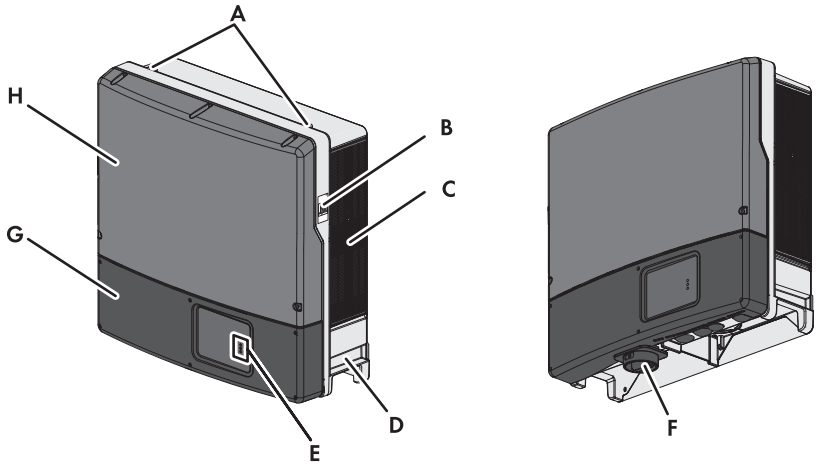


Figure 2: Design of the Sunny Tripower

Position	Designation
A	Thread for screwing in two eye bolts for transport
B	Type label You will find the following information on the type label: • Device type (Model) • Serial number (Serial No.) • Date of manufacture • Device-specific characteristics
C	Ventilation grid
D	Recess

Position	Designation
E	LEDs The LEDs indicate the operating state of the inverter: • Green LED is glowing: operation • Green LED is flashing: the requirements for the connection to the utility grid have not been met. • Red LED is glowing: An error has occurred that must be rectified by a qualified person (for troubleshooting, see service manual at www.SMA-Solar.com). • Blue LED: no function
F	DC load-break switch
G	Lower enclosure lid
H	Upper enclosure lid

Symbols on the Inverter and on the Type Label

Symbol	Explanation
	Inverter This symbol is located next to the green LED which indicates feed-in operation of the inverter.
	Observe the documentation This symbol is located next to the red LED which indicates an error.
	Communication This symbol is located next to the blue LED.
	Danger This symbol indicates that the inverter must be additionally grounded if a second grounding conductor or equipotential bonding is required locally (see Section 6.3.3 "Connecting Additional Grounding", page 24).
	QR Code Links to additional information on the inverter can be found at www.SMA-Solar.com.
	Danger to life due to high voltages The product operates at high voltages. All work on the product must be carried out by qualified persons only.

Symbol	Explanation
	Risk of burns from hot surfaces The product can get hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.
	Observe the documentation Observe all documentation supplied with the product.
DC	Direct current
	The product does not have a transformer.
AC 3N ~	Alternating current
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the locally applicable disposal regulations for electronic waste.
CE	CE marking The product complies with the requirements of the applicable EU directives.
IP65	Degree of protection IP65 The product is protected against dust intrusion and water jets from any angle.
	The product is suitable for outdoor installation.
	RAL quality mark for solar products The product complies with the requirements of the German Institute for Quality Assurance and Certification.
	Certified safety The product is VDE-tested and complies with the requirements of the German Equipment and Product Safety Act.
	C-Tick The product complies with the requirements of the applicable Australian EMC standards.

4.2 Interfaces and Functions

RS485 interface

The inverter can communicate via cables with special SMA communication products via the RS485 interface (information on supported SMA products at www.SMA-Solar.com). The RS485 interface can be retrofitted.

SMA Speedwire/Webconnect

SMA Speedwire/Webconnect is a type of communication based on the Ethernet standard, and allows you to connect the inverter to a Speedwire network. Webconnect allows for data exchange between the inverter and Sunny Portal. Sunny Portal is an Internet portal which allows you to monitor PV systems and to visualize and present PV system data.

Multifunction relay

You can configure the multifunction relay for various operating modes. The multifunction relay is used, for example, to switch fault indicators on or off (for information on installation and configuration, see installation manual of the multifunction relay). The multifunction relay can be retrofitted.

SMA Power Control Module

The SMA Power Control Module enables the inverter to implement grid management services and is equipped with an additional multifunction relay (for information on installation and configuration, see the installation manual of the SMA Power Control Module). The SMA Power Control Module can be retrofitted.

SMA OptiTrac Global Peak

SMA OptiTrac Global Peak is an advancement of SMA OptiTrac and allows the operating point of the inverter to follow the MPP precisely at all times. In addition, with the aid of SMA OptiTrac Global Peak, the inverter can detect the presence of several maximum power points in the available operating range, such as may occur particularly with partially shaded strings. SMA OptiTrac Global Peak is enabled by default.

Grid Management Services

The inverter is equipped with service functions for grid management.

Depending on the requirements of the grid operator, you can activate and configure the functions (e.g. active power limitation) via operating parameters.

Surge arrester type II

Surge arresters of type II limit dangerous overvoltages. Surge arresters of type I can be retrofitted.

5 Mounting

5.1 Requirements for Mounting

Requirements for the mounting location:

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter in areas containing highly flammable materials or gases.
- Do not mount the inverter in a potentially explosive atmosphere.

☐ Do not mount the inverter on a pillar.

☐ The mounting location must be inaccessible to children.

☐ A solid support surface must be available for mounting, e.g. concrete or masonry. When mounted on drywall or similar materials, the inverter emits audible vibrations during operation which could be perceived as annoying.

☐ The mounting location must be suitable for the weight and dimensions of the inverter (see Section 10 "Technical Data", page 36).

☐ To ensure optimum operation, the ambient temperature should be between -25°C and 40°C.

☐ The mounting location should not be exposed to direct solar irradiation. Direct solar irradiation can cause the inverter to overheat. As a result, the inverter reduces its power output.

☐ Climatic conditions must be met (see Section 10 "Technical Data", page 36).

☐ The mounting location should be clear and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.

Dimensions for mounting:

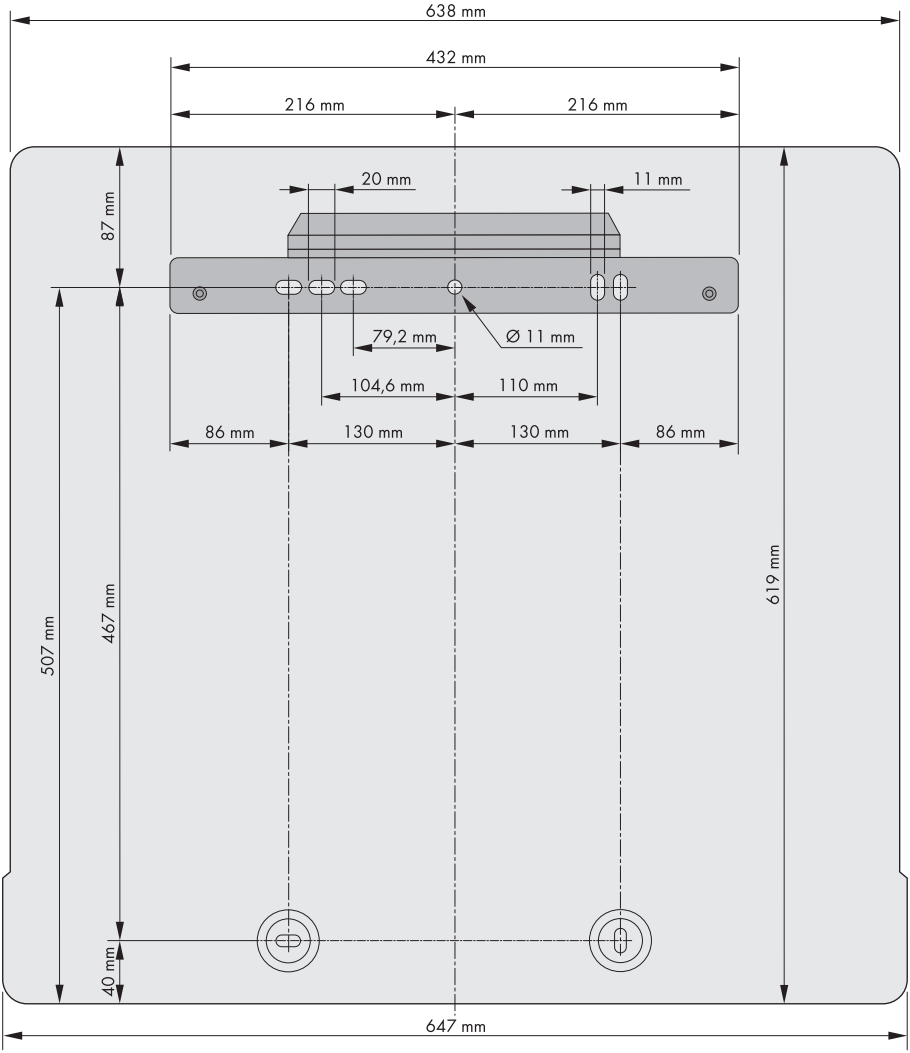


Figure 3: Position of the anchoring points

Recommended clearances:

Provided that the recommended clearances are observed, adequate heat dissipation will be ensured. Thus, you will prevent power reduction due to excessive temperature.

☐ Observe the recommended clearances to walls as well as to other inverters or objects.

☐ If multiple inverters are mounted in areas with high ambient temperatures, increase the clearances between the inverters and ensure sufficient fresh-air supply.

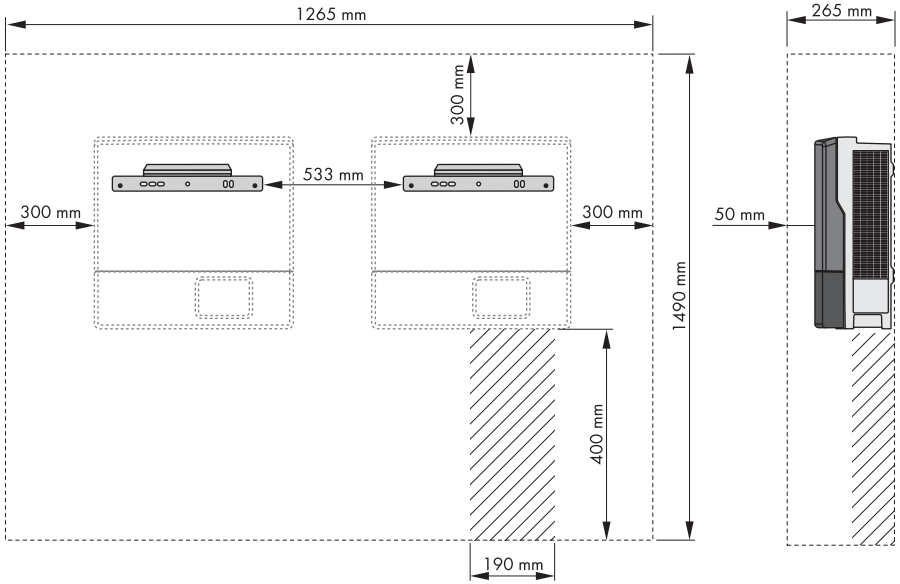


Figure 4: Recommended clearances

Permitted and prohibited mounting positions:

☐ The inverter must be mounted in one of the permitted positions. This will ensure that no moisture can penetrate the inverter.

☐ The inverter should be mounted in such a way that LED signals can be read without difficulty.

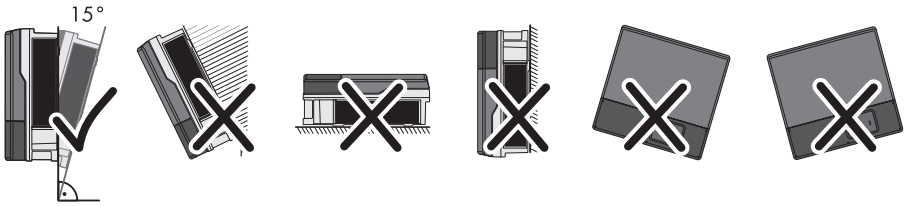


Figure 5: Permitted and prohibited mounting positions

5.2 Mounting the Inverter

Additionally required mounting material (not included in the scope of delivery):

☐ At least two screws that are suitable for the support surface (size: M10 at maximum)

☐ At least two washers that are suitable for the screws (diameter: 30 mm at maximum)

☐ At least two screw anchors that are suitable for the support surface and the screws

☐ For transporting the inverter with a crane: two eye bolts suitable for the weight of the inverter (size: M10)

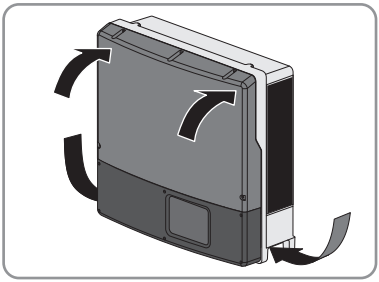
☐ To secure the inverter from being lifted off: two screws, washers and screw anchors that are suitable for the support surface

⚠ CAUTION

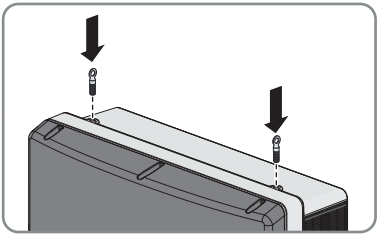
Risk of injury when lifting the inverter, or if it is dropped

The inverter weighs 61 kg. There is risk of injury if the inverter is lifted incorrectly or dropped while being transported or when attaching it to or removing it from the wall mounting bracket.

- Carry and lift the inverter upright with several people without tilting it. With one hand grasp the recessed grip, and with the other hand support the top part of the enclosure. This will prevent the inverter tipping forward.



- If the inverter is to be transported and lifted with a crane, remove the filler plugs on the top of the inverter and screw the eye bolts into the threads.



⚠ CAUTION

Risk of burns from hot surfaces

During operation, the inverter can get hot.

- Mount the inverter in such a way that it cannot be touched inadvertently during operation.

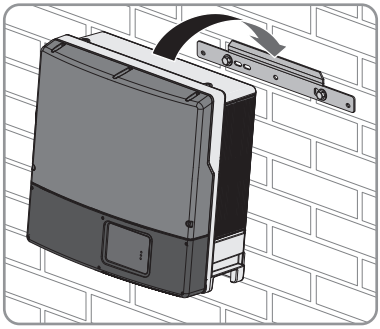
Procedure:

1. **⚠ WARNING**

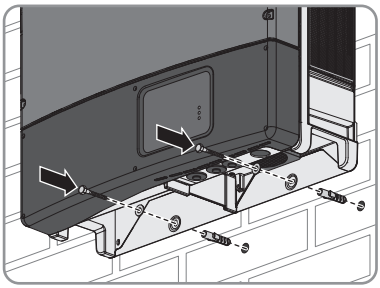
   Risk of electric shock if electric cables and other supply lines are damaged by drilling

   - Before drilling, ensure that there are no electric cables and supply lines in the wall that could be damaged.

2. Align the wall mounting bracket horizontally on the wall and use it to mark the position of the drill holes. Use at least one hole on the right-hand and left-hand side in the wall mounting bracket.
3. If the inverter is to be secured from being lifted off of the wall mounting bracket, mark the position of the drill holes for the screw that attaches the inverter to the wall mounting bracket. Observe the dimensions of the drill holes at the bottom of the inverter rear panel.
4. Drill the holes.
5. Plug one screw anchor into each hole.
6. Secure the wall mounting bracket horizontally using screws and washers.
7. Hook the inverter into the wall mounting bracket.



8. When using a crane to transport the inverter, remove the eye bolts after hooking the inverter into the bracket and attach the filler plugs again.
9. In order to secure the inverter from being lifted off the wall accidentally, attach it to the wall with suitable mounting material. Use both of the lower drill holes on the rear panel of the inverter.



10. Ensure that the inverter is securely in place.

6 Electrical Connection

6.1 Safety during Electrical Connection

⚠ DANGER

Danger to life due to high voltages of the PV array

When exposed to sunlight, the PV array generates dangerous DC voltage which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks. If you disconnect the DC connectors from the inverter under load, an electric arc may occur leading to electric shock and burns.

- Do not touch uninsulated cable ends.
- Do not touch the DC conductors.
- Do not touch any live components of the inverter.
- Have the inverter mounted, installed and commissioned by qualified persons with the appropriate skills only.
- If an error occurs, have it rectified by qualified persons only.
- Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document (see Section 9, page 34).

NOTICE

Damage to the seal of the enclosure lids in subfreezing

If you open the upper and lower enclosure lids in subfreezing conditions, the enclosure's seal can be damaged. This can lead to moisture entering the inverter.

- Do not open the inverter at ambient temperatures lower than -5 °C.
- If a layer of ice has formed on the seal of the lid in sub-zero conditions, remove it prior to opening the enclosure lids of the inverter (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

6.2 Overview of the Connection Area

6.2.1 View from Below

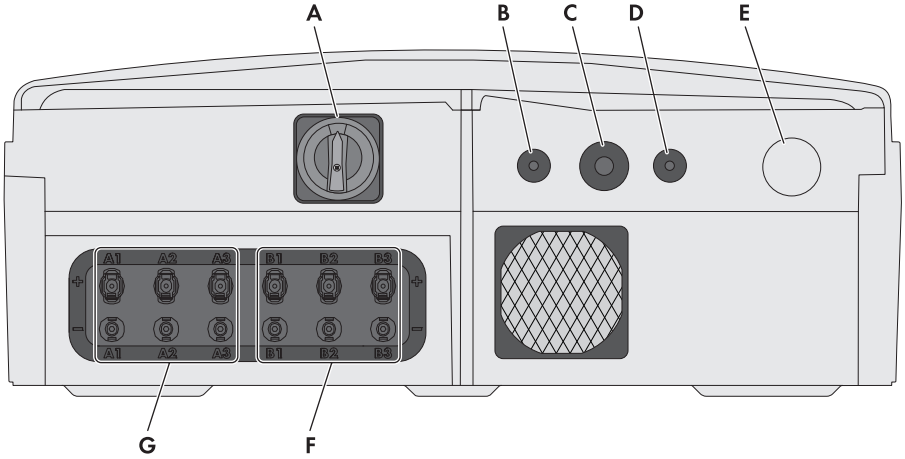


Figure 6: Enclosure openings at the bottom of the inverter

Position	Designation
A	DC load-break switch
B	Enclosure opening M20 with filler plug for the cable of the multifunction relay or SMA Power Control Module
C	Enclosure opening M32 with filler plug for the data cables or network cables
D	Enclosure opening M20 with filler plug for the data cables or network cables
E	Enclosure opening for the AC connection
F	Positive and negative DC connectors, input B
G	Positive and negative DC connectors, input A

6.2.2 Interior View

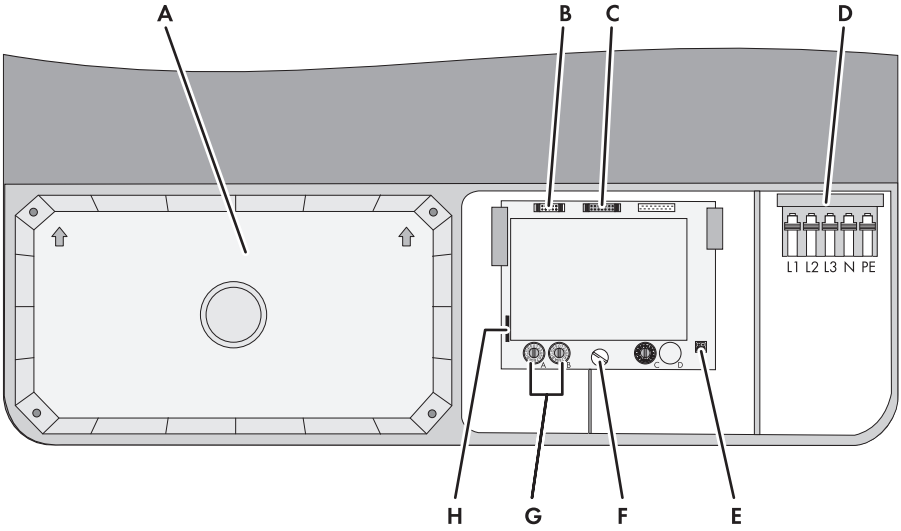


Figure 7: Connection areas in the interior of the inverter

Position	Designation
A	DC protective cover
B	Pin connector for connecting the multifunction relay or the SMA Power Control Module
C	Pin connector for connecting the communication interface or the data module
D	Connecting terminal plate for the AC cable
E	Jumper slot for switching the display language to English
F	Screw to release and attach the communication board
G	Rotary switch A and B for setting the country data set
H	Slot for the SD memory card, for service purposes only

6.3 AC Connection

6.3.1 Requirements for the AC Connection

Cable requirements:

- ☐ External diameter: 14 mm to 25 mm
- ☐ Conductor cross-section: 4 mm² to 16 mm²
- ☐ Maximum conductor cross-section with bootlace ferrule: 10 mm²

- ☐ Insulation stripping length: 12 mm
- ☐ The cable must be dimensioned in accordance with any local and national guidelines on cable dimensions which specify requirements for the minimum conductor cross-section. Examples of factors influencing cable dimensioning are: nominal AC current, type of cable, routing method, cable bundling, ambient temperature and maximum desired line losses (for calculation of line losses, see design software "Sunny Design" from software version 2.0 at www.SMA-Solar.com).

Load-break switch and cable protection:

NOTICE

Damage to the inverter due to the use of screw-type fuses as load-break switches

Screw-type fuses (e.g. DIAZED fuse or NEOZED fuse) are not load-break switches.

- Do not use screw-type fuses as load-break switches.
- Use a load-break switch or circuit breaker as a load disconnection unit (for information and design examples, see the Technical Information "Circuit Breaker" at www.SMA-Solar.com).

- ☐ In PV systems with multiple inverters, protect each inverter with a separate three-phase circuit breaker. Make sure to observe the maximum permissible fuse protection (see Section 10 "Technical Data", page 36). This will prevent residual voltage being present at the corresponding cable after disconnection.

Residual-current monitoring unit:

- ☐ If an external residual-current device is required, install a residual-current device which trips at a residual current of 100 mA or higher (for details on selecting a residual-current device, see the Technical Information "Criteria for Selecting a Residual-Current Device" at www.SMA-Solar.com).

Overvoltage category:

The inverter can be used in grids of installation category III or lower in accordance with IEC 60664-1. That means that the inverter can be permanently connected to the grid-connection point of a building. In case of installations with long outdoor cabling routes, additional measures to reduce overvoltage category IV to overvoltage category III are required (see the Technical Information "Overvoltage Protection" at www.SMA-Solar.com).

Grounding:

i Safety in accordance with IEC 62109

The inverter is not equipped with a grounding conductor monitoring device. In order to guarantee safety in accordance with IEC 62109, one of the following measures must be taken:

- Connect a grounding conductor made of copper wire with a cross-section of at least 10 mm² to the connecting terminal plate for the AC cable.
- Connect additional grounding with the same cross-section as the connected grounding conductor to the connecting terminal plate for the AC cable (see Section 6.3.3 "Connecting Additional Grounding", page 24). This prevents touch current if the grounding conductor at the connecting terminal plate for the AC cable fails.

Connection of additional grounding

In some countries, a second grounding is required as a matter of principle (see Section 6.3.3 "Connecting Additional Grounding", page 24). In each case, observe the locally applicable regulations.

6.3.2 Connecting the Inverter to the Utility Grid

⚠ QUALIFIED PERSON

Requirements:

☐ The connection requirements of the grid operator must be met.

☐ The grid voltage must be in the permissible range. The exact operating range of the inverter is specified in the operating parameters.

Procedure:

1. Disconnect the circuit breaker from all three line conductors and secure against reconnection.
2. If the lower enclosure lid is mounted, loosen all screws of the lower enclosure lid using an Allen key (AF 3) and lift the enclosure lid from below and remove it.
3. Remove the adhesive tape from the enclosure opening for the AC cable.
4. Attach the AC cable gland to the enclosure opening for the AC cable using a counter nut.
5. Route the AC cable into the inverter through the cable gland. If necessary, slightly loosen the swivel nut of the cable gland.
6. Dismantle the AC cable.
7. Shorten L1, L2, L3 and N by 5 mm each.
8. Strip off the insulation of L1, L2, L3, N and PE by 12 mm.
9. Push the safety levers of the AC connecting terminal plate right up to the stop.
10. **⚠ CAUTION**

    Risk of fire if two conductors are connected to one terminal

    If you connect two conductors to a terminal, a fire can occur due to a bad electrical connection.

    - Never connect more than one conductor per terminal.
11. **⚠ CAUTION**

    Danger of crushing when locking levers snap shut

    The locking levers close by snapping down fast and hard.

    - Press the locking levers of the connecting terminal plate for the AC cable down with your thumb only. Do not grip the entire connecting terminal plate for the AC cable between finger and thumb and keep fingers out from under the locking levers.
12. Connect PE, N, L1, L2 and L3 according to the labeling to the connecting terminal plate for the AC cable and push the safety levers down. The direction of the rotating magnetic field of L1, L2 and L3 is not relevant.
13. Make sure that all conductors are securely in place.
14. Screw the swivel nut onto the cable gland.

6.3.3 Connecting Additional Grounding

⚠ QUALIFIED PERSON

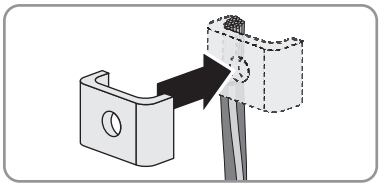
If connection of additional grounding or equipotential bonding is required at the installation site, you must connect additional grounding to the inverter. This prevents touch current if the grounding conductor at the connecting terminal plate for the AC cable fails.

Cable requirement:

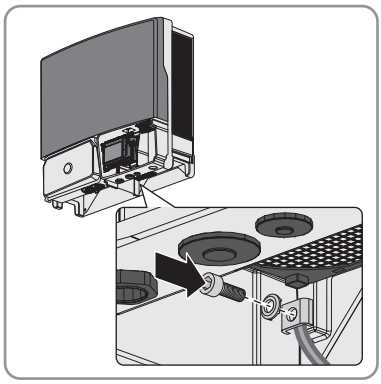
☐ Grounding cable cross-section: 16 mm² at maximum

Procedure:

1. Strip the grounding cable insulation.
2. Lead the clamping bracket over the grounding cable. Arrange the grounding cable to the left.



3. Screw the clamping bracket tight using the M6x16 cylindrical screw and the conical spring washer (torque: 6 Nm). The teeth of the conical spring washer must face the clamping bracket.



6.4 DC Connection

6.4.1 Requirements for the DC Connection

Requirements for the PV modules per input:

☐ All PV modules must be of the same type.

☐ The same number of series-connected PV modules must be connected to all strings.

☐ All PV modules must be aligned identically.

☐ All PV modules must have the same tilt angle.

☐ The maximum input current per string must be maintained and must not exceed the through-fault current of the DC connectors (see Section 10 "Technical Data", page 36).

☐ The thresholds for the input voltage and the input current of the inverter must be adhered to (see Section 10 "Technical Data", page 36).

☐ On the coldest day based on statistical records, the open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter.

☐ The positive connection cables of the PV modules must be fitted with the positive DC connectors (for information on assembling DC connectors, see the DC connector installation manual).

☐ The negative connection cables of the PV modules must be fitted with the negative DC connectors (for information on assembling DC connectors, see the DC connector installation manual).

Use of Y adapters for parallel connection of strings

The Y adapters must not be used to interrupt the DC electric circuit.

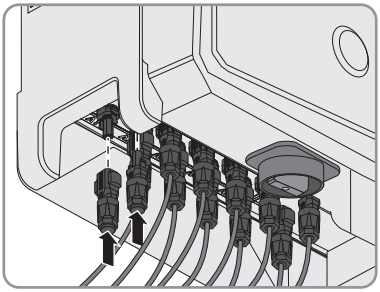
- Do not use the Y adapters in the immediate vicinity of the inverter. The adapters must not be visible or freely accessible.
- In order to interrupt the DC electric circuit, always disconnect the inverter as described in this document (see Section 9, page 34).

6.4.2 Connecting the PV Array

⚠ QUALIFIED PERSON

1. Ensure that the circuit breaker is switched off from all three line conductors and that it cannot be reconnected.
2. Check the strings for ground faults (see service manual at www.SMA-Solar.com).
3. Check whether the DC connectors have the correct polarity.

   If the DC connector is equipped with a DC cable of the wrong polarity, the DC connector must be configured again. The DC cable must always have the same polarity as the DC connector.
4. Ensure that the open-circuit voltage of the PV array does not exceed the maximum input voltage of the inverter.
5. Connect the assembled DC connectors to the inverter.



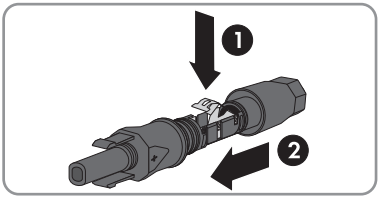
☑ The DC connectors snap audibly into place.

6. NOTICE

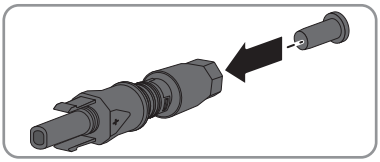
Damage to the inverter due to moisture ingress

The inverter is only properly sealed when all unused DC inputs are closed with DC connectors and sealing plugs.

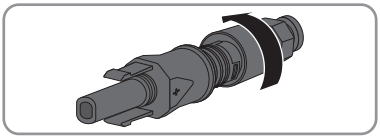
- Do not insert the sealing plugs directly into the DC inputs on the inverter.
- For unused DC connectors, push down the clamping bracket and push the swivel nut up to the thread.



- Insert the sealing plug into the DC connector.



- Tighten the DC connector (torque: 2 Nm).



- Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.
  - ☑ The DC connectors snap audibly into place.

7. Ensure that all DC connectors are securely in place.

6.4.3 Retrofitting the Surge Arrester Type II

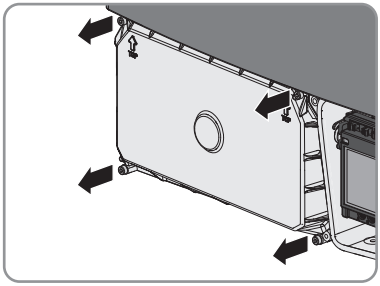
The inverter is equipped ex works with surge arresters or it can be retrofitted (see Section 11 "Accessories", page 41).

1. ⚠ DANGER

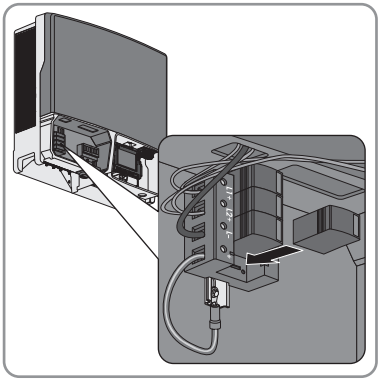
Danger to life due to high voltages

- Disconnect the inverter from all voltage sources (see Section 9, page 34).
- Wait 20 minutes before you remove the DC protective cover to allow residual voltages to discharge.

2. Release the screws of the DC protective cover using an Allen key (AF 3), lift the DC protective cover upwards from below and remove it.



3. Plug the new surge arresters into the slots provided until they lock into place with the locking tabs. The inspection window must be located on the right-hand side.



4. Position the DC protective cover at the upper edge, flip down and tighten it (torque: 3.5 Nm).

7 Commissioning

7.1 Procedure

Procedure		See
1.	Check which country data set the inverter is set to.	Supplementary sheet with the default settings or type label
2.	If the country data set is not set correctly for your country or your purpose, adjust to the required country data set and the corresponding display language within the first ten feed-in hours via the rotary switches in the inverter.	Section 7.2, page 28
3.	Commission the inverter.	Section 7.3, page 30

7.2 Configuring the Country Data Set

⚠ QUALIFIED PERSON

Set the country data set appropriate for your country or purpose within the first ten feed-in hours via the rotary switches in the inverter. After the first ten feed-in hours, the country data set can only be changed by means of a communication product.

Country data set for operation with external decoupling protection

When operating the PV system with external decoupling protection, the inverter has the additional country data set **Medium-Voltage Directive (Germany)**. This country data set allows you to extend the operating range of the inverter for voltage and frequency. This country data set should only be selected if the PV system is disconnected via external decoupling.

- If you set the country data set for operation with external decoupling protection, you must only operate the inverter with an external three-phase decoupling protection. Without external three-phase decoupling protection, the inverter will not disconnect from the utility grid when the country-specific standard requirement is exceeded.

Rotary Switch Positions

Rotary switch A	Rotary switch B	Country data set
0	0	Default setting
1	0	VDE0126-1-1
1	2	VDE-AR-N4105*
1	6	VDE-AR-N4105-HP**
1	B	VFR2014
2	8	AS4777.3[1]
3	2	CEI 0-21 external[1]***

Rotary switch A	Rotary switch B	Country data set
4	0	RD1699[1]
4	1	RD1663/661-A[1]
4	8	PPC
5	A	G59/3
6	0	EN50438
6	E	NEN-EN50438
7	8	C10/11/2012
A	0	Medium-Voltage Directive (Germany)[1]
A	C	SI4777_HS131_Pf[1]
B	0	MVtgDirective Internal[1]
B	8	IEC61727/MEA[1]
B	C	IEC61727/PEA[1]
D	0	Island mode 60 Hz[1]
E	0	Island mode 50 Hz[1]

* Setting in accordance with VDE-AR-N 4105 for PV systems ≤ 3.86 kVA (Germany)
** Setting in accordance with VDE-AR-N 4105 for PV systems ≤ 13.8 kVA (Germany)
*** Setting in accordance with CEI 0-21 for PV systems with external grid and PV system protection > 6 kW (Italy)
[1] Country data set in preparation

This overview is only an extract at the time of printing. You can find a current, detailed list in the Technical Information "Overview of the Rotary Switch Settings" at www.SMA-Solar.com.

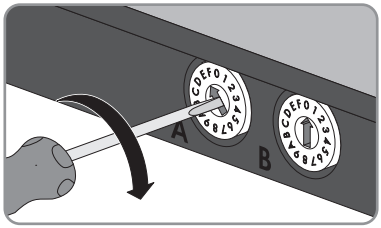
Procedure:

1. **⚠ DANGER**

   Danger to life due to high voltages

   - Ensure that the inverter is disconnected from all voltage sources and that the enclosure lid is removed (see Section 9, page 34).

2. Set the rotary switches **A** and **B** to the required position using a flat-blade screwdriver (blade width: 2.5 mm).



☑ The inverter will adopt the setting after commissioning. This can take up to five minutes.

7.3 Commissioning the Inverter

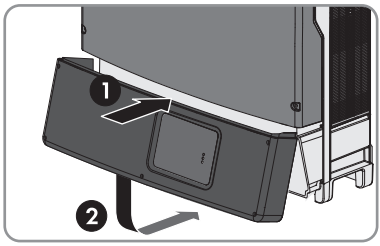
⚠ QUALIFIED PERSON

Requirements:

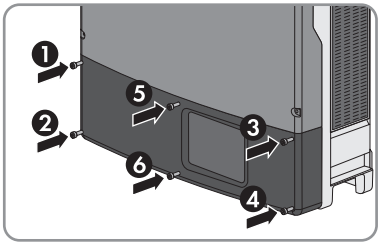
- ☐ The inverter must be correctly mounted.
- ☐ The circuit breaker must be correctly rated.
- ☐ All cables must be correctly connected.
- ☐ Unused DC inputs must be sealed using the corresponding DC connectors and sealing plugs.
- ☐ The country data set must be set correctly for the country or the purpose.
- ☐ Unused openings for the Ethernet connection or the communication connection in the inverter enclosure must be sealed tightly. The factory-mounted filler plugs can be used for that purpose.

Procedure:

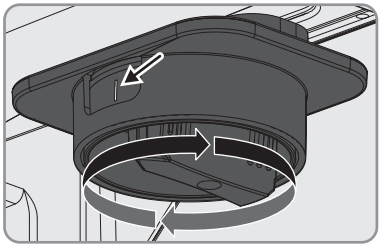
1. Make sure that the AC cable is routed in such way that it cannot be damaged by the partition in the lower enclosure lid.
2. Insert the lower enclosure lid from above and fold it down. The screws must protrude from the lower enclosure lid.



3. Tighten all six screws with an Allen key (AF 3) in the order 1 to 6 (torque: 2.0 Nm). When observing the prescribed order, you will avoid that the lid is mounted asymmetrically and that the enclosure is not correctly sealed.



4. Turn the DC load-break switch to the position **I**.



5. Switch on the circuit breaker of all three line conductors.
   ☑ The green LED is glowing. Feed-in operation begins.
   ✖ Green LED is flashing?
   The DC input voltage is still too low.
   - Once the DC input voltage is sufficiently high, feed-in operation begins.

   ✖ The red LED is glowing?
   There is probably an error.
   - Rectify the error (see service manual at www.SMA-Solar.com).

8 Configuration

8.1 Procedure

⚠ QUALIFIED PERSON

Once you have commissioned the inverter, you may have to adjust various settings via the rotary switches in the inverter or via a communication product. This section describes the procedure for configuration and gives an overview of the steps you must perform in the prescribed order.

Procedure		See
1.	If the inverter is equipped with a Speedwire/Webconnect data module, integrate the inverter in a Speedwire network and register it in Sunny Portal, if necessary.	Manual of the communication interface at www.SMA-Solar.com
2.	To manage the PV system data or to set the inverter parameters, capture the inverter in a communication product.	Manual of the communication product at www.SMA-Solar.com
3.	Change the PV system time and PV system password.	Manual of the communication product at www.SMA-Solar.com
4.	Activate and set SMA OptiTrac Global Peak for partially shaded PV modules.	Section 8.3, page 33

8.2 Changing Operating Parameters

⚠ QUALIFIED PERSON

This section describes the basic procedure for changing operating parameters. Always change operating parameters as described in this section. Some parameters that have sensitive functions can only be viewed and changed by qualified persons (for further information on changing parameters, refer to the manual of the communication product).

The operating parameters of the inverter are set to certain values by default. To optimize inverter operation, you can change the operating parameters using a communication product.

Requirements:

- ☐ Depending on the type of communication, a computer with Ethernet interface must be available.
- ☐ A communication product corresponding to the type of communication used must be available.
- ☐ The inverter must be registered in the communication product.
- ☐ The changes to the grid-relevant operating parameters must be approved by the responsible grid operator.
- ☐ When changing grid-relevant parameters, the SMA Grid Guard code must be available (see the Certificate "Order Form for the SMA Grid Guard Code" at www.SMA-Solar.com).

Procedure:

1. Call up the user interface of the communication product or software and log in as **Installer** or **User**.
2. If required, enter the SMA Grid Guard code.
3. Select and set the required parameter.
4. Save settings.

8.3 Setting SMA OptiTrac Global Peak

⚠ QUALIFIED PERSON

For partially shaded PV modules, set the time interval at which the inverter is to optimize the MPP of the PV system.

The basic procedure for changing operating parameters is explained in another section (see Section 8.2, page 32).

Procedure:

- Select the parameter **Cycle time of the OptiTrac Global Peak algorithm** or **MPPShdw.CycTms** and set the required time interval. The ideal time interval is usually six minutes. This value should only be increased if the shading situation changes extremely slowly.

☑ The inverter optimizes the MPP of the PV system at the predetermined time interval.

9 Disconnecting the Inverter from Voltage Sources

⚠ QUALIFIED PERSON

Prior to performing any work on the inverter, always disconnect it from all voltage sources as described in this section. Always adhere to the prescribed sequence.

NOTICE

Damage to the seal of the enclosure lids in subfreezing

If you open the upper and lower enclosure lids in subfreezing conditions, the enclosure's seal can be damaged. This can lead to moisture entering the inverter.

- Do not open the inverter at ambient temperatures lower than -5 °C.
- If a layer of ice has formed on the seal of the lid in sub-zero conditions, remove it prior to opening the enclosure lids of the inverter (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

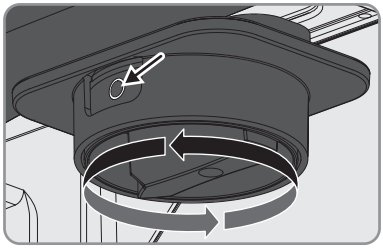
NOTICE

Destruction of the measuring device due to overvoltage

- Only use measuring devices with a DC input voltage range of 1,000 V or higher.

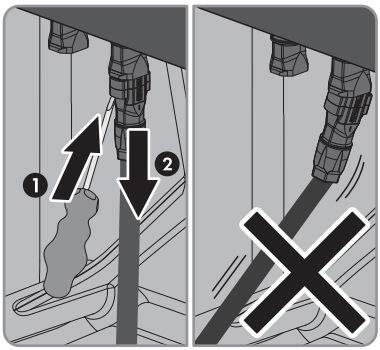
Procedure:

1. Disconnect the circuit breaker from all three line conductors and secure against reconnection.
2. Turn the DC load-break switch to the position **O**.

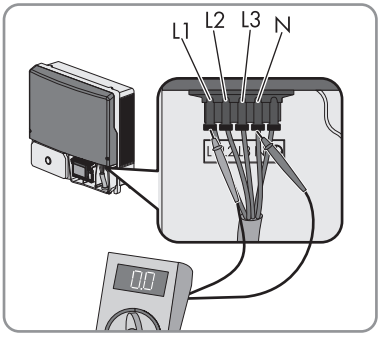


3. If the multifunction relay is used, switch off the load supply voltage, if necessary.
4. Wait until the LEDs have gone out and, if necessary, the load connected to the multifunction relay is switched off.
5. Use a current clamp to ensure that no current is present in the DC cables.
6. Remove all six screws of the lower enclosure lid using an Allen key (AF 3), lift the enclosure lid upwards from below and remove it.

7. Release and remove all DC connectors. Insert a slotted screwdriver or an angled screwdriver (blade width 3.5 mm) into one of the slide slots and pull the DC connectors out downwards. Do not pull on the cable.



8. Ensure that no voltage is present at the DC inputs of the inverter.
9. Use a suitable measuring device to check that no voltage is present at the AC connecting terminal plate between **L** and **N** and afterwards between **L** and **PE**. Insert the test probe (maximum diameter: 2 mm) in each round opening of the terminal.



10. Ensure that no voltage is present between any terminal of the multifunction relay and **PE** of the AC connecting terminal plate.
11. *NOTICE*

    Damage to the inverter due to electrostatic discharge

    The internal components of the inverter can be irreparably damaged by electrostatic discharge.

    - Ground yourself before touching any component.

10 Technical Data

DC Input

	STP 20000TL-30	STP 25000TL-30
Maximum DC power at cos φ = 1	20,440 W	25,550 W
Maximum input voltage	1,000 V	1,000 V
MPP voltage range	320 V to 800 V	390 V to 800 V
Rated input voltage	600 V	600 V
Minimum input voltage	150 V	150 V
Initial input voltage	188 V	188 V
Maximum input current, input A	33 A	33 A
Maximum input current, input B	33 A	33 A
Number of independent MPP inputs	2	2
Strings per MPP input	3	3
Overvoltage category as per IEC 60664-1	II	II

AC Output

	STP 20000TL-30	STP 25000TL-30
Rated power at 230 V, 50 Hz	20,000 W	25,000 W
Maximum apparent AC power	20,000 VA	25,000 VA
Rated grid voltage	230 V	230 V
Nominal AC voltage	220 V / 230 V / 240 V	220 V / 230 V / 240 V
AC voltage range*	180 V to 280 V	180 V to 280 V
Nominal AC current at 220 V / 230 V / 240 V	29 A	36.2 A
Maximum output current	29 A	36.2 A
Maximum output current under fault conditions	50 A	50 A
Total harmonic distortion of the output current with total harmonic distortion of the AC voltage < 2%, and AC power > 50% of the rated power	≤ 3%	≤ 3%
Rated power frequency	50 Hz	50 Hz
AC power frequency*	50 Hz / 60 Hz	50 Hz / 60 Hz

	STP 20000TL-30	STP 25000TL-30
Operating range at AC power frequency 50 Hz	44 Hz to 55 Hz	44 Hz to 55 Hz
Operating range at AC power frequency 60 Hz	54 Hz to 65 Hz	54 Hz to 65 Hz
Power factor at rated power	1	1
Displacement power factor, adjustable	$0_{overexcited}$ to $0_{underexcited}$	$0_{overexcited}$ to $0_{underexcited}$
Feed-in phases	3	3
Connection phases	3	3
Overvoltage category as per IEC 60664-1	III	III

* depending on the configured country data set

Efficiency

	STP 20000TL-30	STP 25000TL-30
Maximum efficiency, η_{max}	98.4%	98.4%
European efficiency, η_{EU}	98.0%	98.0%

Protective Devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection point*	DC load-break switch
DC overvoltage protection	Thermally monitored varistors optional: surge arrester type II
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	50 A
Ground-fault monitoring	Insulation monitoring: R_{iso} > 250 kΩ
All-pole sensitive residual-current monitoring unit	Available

* Optional

General Data

Width x height x depth	665 mm x 690 mm x 265 mm
Weight	61 kg
Length x width x height of the packaging	780 mm x 380 mm x 790 mm
Transport weight	68 kg

Climatic category in accordance with IEC 60721-3-4	4K4H
Environmental category	outdoors
Pollution degree outside the enclosure	3
Pollution degree inside the enclosure	2
Operating temperature range	-25°C to +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level	3,000 m
Typical noise emission	51 dB(A)
Power loss in night mode	1 W
Topology	transformerless
Cooling concept	SMA OptiCool
Degree of protection for electronics in accordance with IEC 60529	IP65
Protection class in accordance with IEC 61140	I
Grid configurations	TN-C, TN-S, TN-C-S, TT (when V_{N_PE} < 20 V)
National standards and approvals, as per 07/2014*	AS 4777, BDEW 2008, C10/11:2012, CE, CEI 0-16, CEI 0-21, DIN EN 62109-1, EN 50438, G59/3, IEC 61727/MEA, IEC 61727/PEA, IEC 62109-2, NEN EN 50438, NRS 097-2-1, PPC, RD 661/2007, RD 1699:2011, SI 4777, VDE-AR-N4105, VDE 0126-1-1, VFR 2014, UTE C15-712-1

* **AS 4777, BDEW 2008, CEI 0-16, CEI 0-21, IEC 61727/MEA, IEC 61727/PEA, NRS 097-2-1, SI 4777:** In preparation.
EN 50438: Does not apply to all country standard deviations of EN 50438
IEC 62109-2: In order to meet the requirements of this standard, the inverter must either be equipped with a multifunction relay used as a fault indicator contact or there must be a connection to Sunny Portal with the fault alarm in Sunny Portal activated.
NRS 97-1-2: This standard requires a separate label attached to the AC distribution board which indicates the AC-side disconnection of the inverter in case of a grid failure (for further details, see NRS 97-1-2, Sect. 4.2.7.1 and 4.2.7.2).
RD 1699 and RD 661/2007: Contact the SMA Service Line for restrictions in specific regions.

Climatic Conditions in Accordance with IEC 60721-3-4, Installation Type C, Class 4K4H

Extended temperature range	-25°C to +60°C
Extended humidity range	0% to 100%
Threshold for relative humidity, non-condensing	100%
Extended air pressure range	79.5 kPa to 106 kPa

Climatic Conditions in Accordance with IEC 60721-3-4, Transport Type E, Class 2K3

Temperature range	-25°C to +70°C

Features

DC connection	SUNCLIX DC connector
AC connection	Spring-cage terminal
Multifunction relay	Optional
RS485, galvanically isolated	Optional
Speedwire/Webconnect data module	Optional
SMA Power Control Module	Optional
Surge arrester type II	Optional

Fans

Width x height x depth	60 mm x 60 mm x 25.4 mm
Noise emission, typical	≤ 29 dB(A)
Maximum operating altitude	3,000 m
Air flow rate	≥ 40 m^3/h

Torques

Upper lid screws	6 Nm ± 0.3 Nm
Screws lower lid	2 Nm ± 0.3 Nm
Screws for DC protective cover	3.5 Nm
Screw for additional grounding	5.8 Nm
SUNCLIX swivel nut	2 Nm

Data Storage Capacity

Daily energy yields	63 days
Daily yields	30 years

Event messages for users	250 events
Event messages for installers	250 events

11 Accessories

You will find the accessories for your product in the following overview. If required, these can be ordered from SMA Solar Technology AG or your distributor.

Designation	Brief description	SMA order number
RS485 data module	485 data module as retrofit kit	DM-485CB-10
Speedwire/Webconnect data module	Speedwire/Webconnect data module as retrofit kit	SWDM-10
SMA Power Control Module	Multifunction interface for implementing grid management services	PWCMOD-10
Multifunction relay retrofit kit	Multifunction relay for retrofitting in PV inverters	MFR01-10
Surge arrester type II	Retrofit kit DC surge arresters type II for input A and B	DC_SPD_KIT3-10

12 Contact

If you have technical problems with our products, contact the SMA Service Line. We need the following information in order to provide you with the necessary assistance:

- Inverter device type
- Inverter serial number
- Inverter firmware version
- Special country-specific settings of the inverter (if applicable)
- Type and number of PV modules connected
- Mounting location and altitude of the inverter
- Three-digit or four-digit event number and display message of the inverter
- Optional equipment, e.g. communication products
- Use of the multifunction relay (if present)

Australia	SMA Australia Pty Ltd. Sydney	Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200
Belgien/Belgique/België	SMA Benelux BVBA/SPRL Mecheln	+32 15 286 730
Brasil	Vide España (Espanha)	
Česko	SMA Central & Eastern Europe s.r.o. Praha	+420 235 010 417
Chile	Ver España	
Danmark	Se Deutschland (Tyskland)	
Deutschland	SMA Solar Technology AG Niestetal	Medium Power Solutions Wechselrichter: +49 561 9522-1499 Kommunikation: +49 561 9522-2499 SMA Online Service Center: www.SMA.de/Service
		Hybrid Energy Solutions Sunny Island: +49 561 9522-399 PV-Diesel Hybridsysteme: +49 561 9522-3199
		Power Plant Solutions Sunny Central: +49 561 9522-299
España	SMA Ibérica Tecnología Solar, S.L.U. Barcelona	Llamada gratuita en España: 900 14 22 22 Internacional: +34 902 14 24 24

France	SMA France S.A.S. Lyon	Medium Power Solutions Onduleurs : +33 472 09 04 40 Communication : +33 472 09 04 41
		Hybrid Energy Solutions Sunny Island : +33 472 09 04 42
		Power Plant Solutions Sunny Central : +33 472 09 04 43
India	SMA Solar India Pvt. Ltd. Mumbai	+91 22 61713888
Italia	SMA Italia S.r.l. Milano	+39 02 8934-7299
Κύπρος/Kıbrıs	Βλέπε Ελλάδα/ Bkz. Ελλάδα (Yunanistan)	
Luxemburg/ Luxembourg	Siehe Belgien Voir Belgique	
Magyarország	lásd Česko (Csehország)	
Nederland	zie Belgien (België)	
Österreich	Siehe Deutschland	
Perú	Ver España	
Polska	Patrz Česko (Czechy)	
Portugal	SMA Solar Technology Portugal, Unipessoal Lda Lisboa	Isento de taxas em Portugal: 800 20 89 87 Internacional: +351 212377860
România	Vezi Česko (Cehia)	
Schweiz	Siehe Deutschland	
Slovensko	pozri Česko (Česká republika)	
South Africa	SMA Solar Technology South Africa Pty Ltd. Centurion (Pretoria)	08600 SUNNY (08600 78669) International: +27 (12) 643 1785
United Kingdom	SMA Solar UK Ltd. Milton Keynes	+44 1908 304899
Ελλάδα	SMA Hellas AE Αθήνα	801 222 9 222 International: +30 212 222 9 222
България	Вижте Ελλάδα (Гърция)	
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ	+66 2 670 6999

대한민국	SMA Technology Korea Co., Ltd. 서울	+82 2 508-8599
中国	SMA Beijing Commercial Company Ltd. 北京	+86 10 5670 1350
+971 2 234-6177	SMA Middle East LLC أبو ظبي	الإمارات العربية المتحدة
Other countries	International SMA Service Line Niestetal	Toll free worldwide: 00800 SMA SERVICE (+800 762 7378423)

13 EC Declaration of Conformity

within the meaning of the EC directives

- 2004/108/EC (electromagnetic compatibility, EMC)
- 2006/95/EC (low voltage, LVD)

SMA Solar Technology AG confirms herewith that the inverters described in this document are in compliance with the fundamental requirements and other relevant provisions of the above mentioned directives. The entire EC Declaration of Conformity can be found at www.SMA-Solar.com.

CE

SMA Solar Technology

www.SMA-Solar.com